

# 2021 AFOSR Biophysics Program Review

Dr. Sofi Bin-Salamon | November 29 – December 3, 2021 | Arlington, VA

## Basic Research Innovation and Collaboration Center

4100 North Fairfax Drive (Suite 450)

Arlington, VA 22203

### Day 1 - Monday, 29 November 2021

TIME	TOPIC	SPEAKER
0830-0900	<b>REGISTRATION</b>	
0900-0910	Remarks	<b>Dr. Sofi Bin-Salamon</b> Program Manager Air Force Office of Scientific Research
0910-0930	Multi-Disciplinary University Research Initiative: Nanoelectropulse-Induced Electromechanical Signaling and Control of Biological Systems	<b>Prof. Andrei Pakhomov</b> Frank Reidy Center for Bioelectrics Old Dominion University
0930-1020	Advances in remote stimulation by targeted interference of nanosecond pulsed electric fields	<b>Prof. Andrei Pakhomov</b> Frank Reidy Center for Bioelectrics Old Dominion University
1020-1040	<b>BREAK</b>	
1050-1130	Bipolar signal cancellation of electrostimulated transmembrane traffic — <b>Multiple</b> membrane perturbation and permeabilization phenomena	<b>Dr. Federica Castellani</b> Frank Reidy Center for Bioelectrics Old Dominion University
1130-1210	Molecular mechanisms of permeabilization, activation, and bipolar cancellation with nanoelectropulses	<b>Prof. Olga Pakhomova</b> Frank Reidy Center for Bioelectrics Old Dominion University
1210-1310	<b>LUNCH</b>	
1310-1355	Manipulate electric field penetration and incorporate bipolar nanosecond cancellation for controlling target response	<b>Prof. Shu Xiao</b> Department of Electrical and Computer Engineering Old Dominion University
1355-1445	Novel tools for non-invasive imaging of nsEP effects: what was/is new and exciting?	<b>Prof. Vladislav Yakovlev</b> Department of Biomedical Engineering Texas A&M University
1445-1500	MURI Summary	<b>Prof. Andrei Pakhomov</b> Frank Reidy Center for Bioelectrics Old Dominion University
1500-1530	<b>BREAK</b>	

<b>1530-1600</b>	Label-free, sub-diffraction identification of biomolecules	<b>Prof. Somin Lee</b> Department of Biomedical Engineering University of Michigan
<b>1600-1630</b>	An ultra-high bandwidth nano-electronic interface to the interior of living cells with integrated fluorescence readout of metabolic activity	<b>Prof. Peter Burke</b> Department of Biomedical Engineering University of California, Irvine
<b>1630-1700</b>	Vibration cavity polariton dynamics	<b>Dr. Jeffrey Owrutsky</b> Chemistry Division Naval Research Laboratory
<b>1700</b>	<b>MEETING ADJOURNED FOR THE DAY</b>	

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### Day 2 - Tuesday, 30 November 2021

TIME	TOPIC	SPEAKER
0830-0900	<b>REGISTRATION</b>	
0900-0930	MURI: Cells and Cell Groups as Coupled Biochemical, Electrical, and Mechanical Systems	<b>Prof. Wolfgang Losert</b> Department of Physics University of Maryland
0930-1000	Excitable systems in cells – new sensors and modulators of excitability	<b>Mr. Tatsat Banerjee</b> Department of Cell Biology Johns Hopkins University
1000-1030	Modulating excitable systems with nanotopography and Electric fields (EF)	<b>Ms. Qixin Yang</b> Department of Physics University of Maryland
1030-1100	<b>BREAK</b>	
1100-1130	Electrostatic modulation of membrane protein initiated signaling pathways	<b>Prof. Quan Qing</b> Department of Physics Arizona State University
1130-1145	External Surface Charge Modulation	<b>Mr. Bryan Le</b> Department of Dermatology University of California, Davis
1145-1200	EF modulation of collective behavior	<b>Mr. Kan Zhu</b> Department of Dermatology University of California, Davis
1200-1230	EF modulation Applications: Neurostimulation	<b>Prof. Min Zhao</b> Department of Dermatology University of California, Davis
1230-1330	<b>LUNCH</b>	
1330-1400	Voltage and cytoskeletal imaging of electrically excitable cells	<b>Mr. Sylvester Gates</b> Department of Physics University of Maryland
1400-1430	Neuromorphic Computing	<b>Dr. Corey Hart</b> Advanced Development Programs Lockheed Martin

<b>1430-1500</b>	MURI Summary and Outlook	<b>Prof. Wolfgang Losert</b> Department of Physics University of Maryland
<b>1500-1530</b>	<b>BREAK</b>	
<b>1530-1600</b>	High-throughput bioengineering and synthetic biology using microfluidics	<b>Prof. Arum Han</b> Department of Electrical and Computer Engineering Texas A&M University
<b>1600-1630</b>	Nano-Biophotonics Sensor	<b>Dr. Shashi Karna</b> Weapons and Materials Research Directorate Army Research Laboratory
<b>1630-1700</b>	Opportunities to engage with the Basic Research Office	<b>Dr. Ololade Fatunmbi</b> Basic Research Office Office of the Under Secretary of Defense (R&E)
<b>1700</b>	<b>MEETING ADJOURNED FOR THE DAY</b>	

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### Day 3 - Wednesday, 1 December 2021

TIME	TOPIC	SPEAKER
0830-0850	<b>REGISTRATION</b>	
0850-0900	Remarks	<b>Dr. Sofi Bin-Salamon</b> Program Manager Air Force Office of Scientific Research
0900-0930	Multiscale Electrical Mapping of Biosystems	<b>Prof. Jinglei Ping</b> Department of Mechanical and Industrial Engineering University of Massachusetts Amherst
0930-1000	Ruffling Dynamics of the Plasma Membrane Regulates Active Viscosity Sensing in Cells	<b>Prof. Yun Chen</b> Department of Mechanical Engineering Johns Hopkins University
1000-1030	The role of matrix viscoelasticity in regulating cell biological behavior and physical properties	<b>Prof. Luo Gu</b> Department of Materials Science and Engineering Johns Hopkins University
1030-1100	<b>BREAK</b>	
1100-1130	Fundamental Biophysics Investigations on Upconversion Nanoparticles Modified Photoreceptive Composite Architectures for Enhanced Quantum Optoelectronics	<b>Prof. Shashank Priya</b> Materials Science and Engineering Pennsylvania State University
1130-1200	Colour Sensitive Organic Semiconductor Pixelated Photosensitive Device	<b>Prof. Thomas Brown</b> Department of Electronic Engineering University of Rome, Tor Vergata
1200-1230	Photoreceptive biophysical composite architectures with enhanced quantum optoelectronic conversion for retina-inspired imaging	<b>Prof. Neela Yennawar</b> Huck Institute of Life Sciences Pennsylvania State University
1230-1330	<b>LUNCH</b>	
1330-1400	Investigation of Biophotonic Cellular Communication to Understand Mechanisms of Performance	<b>Dr. Saber Hussain</b> 711th Human Performance Wing Air Force Research Laboratory

<b>1400-1430</b>	Shedding light on brain microdomains	<b>Dr. Valentina Benfenati</b> Institute of Synthesis and Photoreactivity National Research Council of Italy
<b>1430-1500</b>	Multiscale characterization of collective astrocyte dynamics	<b>Prof. Wolfgang Losert</b> Department of Physics University of Maryland <b>Dr. Kate O'Neil</b> Department of Physics University of Maryland
<b>1500-1530</b>	<b>BREAK</b>	
<b>1530-1600</b>	Investigation of Co-cultured Astrocyte and Neuron Populations by Recording Ultra-low Signals with Nanostructured Electrodes	<b>Dr. Annalisa Convertino</b> Institute for Microelectronics and Microsystems National Research Council of Italy
<b>1600-1630</b>	Integration of tips and beams: Walking over pillars and sensing through plasmons	<b>Prof. Ishan Barman</b> Department of Mechanical Engineering Johns Hopkins University
<b>1630-1700</b>	Biophysics and Mechanobiology of Extracellular Vesicle Biogenesis	<b>Prof. Ravi Radhakrishnan</b> Department of Bioengineering University of Pennsylvania
<b>1700</b>	<b>MEETING ADJOURNED FOR THE DAY</b>	

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### Day 4 - Thursday, 2 December 2021

TIME	TOPIC	SPEAKER
0830-0900	<b>REGISTRATION</b>	
0900-0930	Lensless Computational Microendoscopy for Minimally-Invasive Hyperspectral Bio-imaging	<b>Prof. Mark Foster</b> Department of Electrical and Computer Engineering Johns Hopkins University
0930-1000	Free-electron-mediated Modifications of Biomolecules – from Physical Indicators to Molecular Mechanisms	<b>Dr. Norbert Linz</b> Institute of Biomedical Optics University of Lübeck
1000-1030	Chemotactic Movement and Organization of Membranes and Protocells	<b>Prof. Ayusman Sen</b> Department of Chemistry Pennsylvania State University
1030-1100	<b>BREAK</b>	
1100-1130	Oxygen controlled hydrogel to uncover cellular responses to rapid hypoxia	<b>Prof. Sharon Gerecht</b> Institute of Nano Biotechnology Johns Hopkins University
1130-1200	Three-dimensional Brain In Vitro Models via Electrofluidodynamics	<b>Dr. Vincenzo Guarino</b> Institute of Polymers, Composites and Biomaterials National Research Council of Italy
1200-1230	Towards the study of the impact of environmental mechanostimulus on oligodendrocyte precursor differentiation and myelination	<b>Dr. Ana Pêgo</b> Institute of Biomedical Engineering i3S/University of Porto
1230-1330	<b>LUNCH</b>	
1330-1400	3D Printing of Simulated Gut Environment	<b>Prof. Zhijian Pei</b> Department of industrial and Systems Engineering Texas A&M University <b>Prof. Hongmin Qin</b> Department of Biology Texas A&M University

<b>1400-1430</b>	Biomolecular condensates: structures involved in subcellular collective sensing	<b>Prof. Holly Goodson</b> Department of Chemistry University of Notre Dame
<b>1430-1500</b>	Influence of Hydration and Protein Collective Motions on Biological Activities	<b>Prof. Vinh Nguyen</b> Department of Physics Virginia Tech University
<b>1500-1530</b>	<b>BREAK</b>	
<b>1530-1600</b>	Understanding the “Mission Versatility” of Membrane Proteins via Nanoscopic Imaging	<b>Prof. Qian Chen</b> Department of Materials Science Univ. of Illinois Urbana-Champaign
<b>1600-1630</b>	Detail Mechanism of the Visual Process	<b>Prof. Peter Rentzepis</b> Dept. of Electrical and Computer Engineering Texas A&M University
<b>1630-1700</b>	Protein Dynamics Correlate with Quantum Effects on Enzyme Catalysis	<b>Prof. Christopher Cheatum</b> Department of Chemistry University of Iowa
<b>1700</b>	<b>MEETING ADJOURNED FOR THE DAY</b>	

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Day 5 - Friday, 3 December 2021

TIME	TOPIC	SPEAKER
0830-0900	<b>REGISTRATION</b>	
0900-0930	Universal Quantum Standards for Stochastic Biophysics	<b>Prof. James Brozik</b> Department of Chemistry Washington State University
0930-1000	Stochastic Biophysical Interactions within Aquaporin-4 Assemblies	<b>Prof. Grazia Paola Nicchia</b> Department of Bioscience, Biotechnology and Biopharmaceutics University of Bari
1000-1030	Exploring New Biophysical Processes with Quantum Entanglement	<b>Prof. Theodore Goodson</b> Department of Chemistry University of Michigan
1030-1100	Shining light for sensing and control of astrocytes microdomains structure, dynamics and biophysics	<b>Dr. Valentina Benfenati</b> Institute of Synthesis and Photoreactivity National Research Council of Italy
1100-1115	<b>BREAK</b>	
1115-1230	International funding opportunities and the role of research management	<b>Ms. Claire Chen</b> Director, Global Initiatives National Council of University Research Administrators <b>Mr. Jackson Howard</b> Regional Coordinator EURAXESS North America <b>Mr. Ludek Moravec</b> Science and Technology Attaché Embassy of the Czech Republic <b>Mr. Dennis Paffrath</b> Assistant Vice President of Research Administration University of Maryland, Baltimore <b>Ms. Bettina Schuffert</b> Program Officer German Research Foundation

<b>1230-1300</b>	<b>LUNCH</b>	
<b>1300-1400</b>	Non-Classical Sensing and Deep Space Human Exploration	<p><b>Prof. Larry Nagahara</b> Associate Dean for Research Johns Hopkins University</p> <p><b>Prof. Mark Shelhamer</b> Department of Otolaryngology Johns Hopkins University</p> <p><b>Prof. Luigi Ambrosio</b> Director - Institute of Polymers, Composites and Biomaterials National Research Council of Italy</p> <p><b>Ms. Yuko Tsuda</b> Deputy Director Japan Science and Technology Agency Washington DC Office</p>
<b>1400-1430</b>	NIH Funding for Training the Next Generation of Biomedical Researchers	<p><b>Dr. Nastaran Zahir</b> Chief, Cancer Training Branch National Cancer Institute National Institutes of Health</p>
<b>1430-1500</b>	Considerations for Making your Research and Innovation Policy Relevant	<p><b>Dr. Franklin Carrero-Martinez</b> Senior Director Global Sustainability and Development &amp; Science and Technology for Sustainability National Academy of Sciences</p>
<b>1500-1530</b>	<b>BREAK</b>	
<b>1530-1600</b>	Quantum Coherence and Quantum Interactions in Microtubules and Surrounding Environment	<p><b>Prof. Vladislav Yakovlev</b> Department of Biomedical Engineering Texas A&amp;M University</p>
<b>1600-1630</b>	Multidimensional Optical Sensing and Imaging Systems	<p><b>Prof. Bahram Javidi</b> Department of Electrical and Computer Engineering University of Connecticut</p>
<b>1630-1700</b>	Nanomanufacturing Program	<p><b>Dr. Khershed Cooper</b> Program Director National Science Foundation</p>
<b>1700</b>	<b>MEETING CONCLUSION</b>	